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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/821,100	04/07/2004	Zhong Dong	M-15295 US	8965
32605 7590 07/13/2007 MACPHERSON KWOK CHEN & HEID LLP 2033 GATEWAY PLACE SUITE 400 SAN JOSE, CA 95110			EXAMINER VU, DAVID	
			ART UNIT 2818	PAPER NUMBER
			MAIL DATE 07/13/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>		<b>Applicant(s)</b>	
	10/821,100		DONG ET AL.	
	<b>Examiner</b>		<b>Art Unit</b>	
	DAVID VU		2818	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 23 April 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-15 and 21-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 and 21-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

1. Claims 11, 26 and 27 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The original disclosure does not include teaching:

- a) “ONO-type memory cell stack does not include a metal silicide layer” (**claim 11**);
- b) “...flowing the molecular hydrogen (H<sub>2</sub>) towards the stack is constrained to below a volumetric flow ratio of H<sub>2</sub> to O<sub>2</sub> at which formation of a hydrogen flame due to the presence of H<sub>2</sub> is at least unstable if not that the flame is extinguish or unignited due to insufficient presence of H<sub>2</sub>” (**claim 26**); and
- c) “....flowing the molecular hydrogen (H<sub>2</sub>) towards the stack is constrained to below a volumetric flow ratio of H<sub>2</sub> to O<sub>2</sub> at which stable ignited of a hydrogen flame due to the presence of H<sub>2</sub> is assured on a mass production basis” (**claim 27**).

Applicants submit that support for claims is found in figure 3A. However, figure 3A and the specification as written do not exclude application of a metal silicide layer to an ONO-type

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memory cell stack. Also, figure 3A shows hydrogen is applied to ONO structure, but it is not clear how the fig. 3A could support for the limitations "...flowing the molecular hydrogen (H<sub>2</sub>).... is constrained to below a volumetric flow ratio of H<sub>2</sub> to O<sub>2</sub> at which formation of a hydrogen flame due to the presence of H<sub>2</sub> is at least unstable if not that the flame is extinguish or unignited due to insufficient presence of H<sub>2</sub>" (**claim 26**); and "...flowing the molecular hydrogen (H<sub>2</sub>).....is constrained to below a volumetric flow ratio of H<sub>2</sub> to O<sub>2</sub> at which stable ignited of a hydrogen flame due to the presence of H<sub>2</sub> is assured on a mass production basis" (**claim 27**).

Any response to this 112 rejection should include the location in the original disclosure where the subject matter can be found.

### **Claim Rejections - 35 USC § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out

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the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1-15 and 21-24 are rejected under 35 U.S.C. 103 (a) as being unpatentable over You et al. (US Pat. 6,706,613, hereinafter You) in view of Wang et al. (US 2005/0110102, hereinafter Wang).

Regarding claims 1-8, 10,11, 15 and 21-24, You discloses in figs. 2B-2C a method of forming sidewall dielectric on an ONO-type memory cell stack where at least one sidewall of the ONO-type memory cell stack 108 includes a plurality of exposed material layers respectively composed of an oxide 105a and an oxidizable material (nitride layer 106a) disposed adjacent to the oxide 105a, the method comprising subjecting the sidewall 120a to a thermal oxide process to form a sidewall oxide (fig. 2C and col. 5, lines 29-37) and forming an supplemental nitride sidewall dielectric after the rapid oxidation process (col. 7, lines 58-67).

You fails to disclose forming the sidewall oxide layer by hydrogen and oxygen. However, Wang teaches that the sidewall oxide layer is formed by a dry ISSG process at a temperature is about 800-1000°C, the flow rate of  $H_2+O_2$  is about 1slm –40slm {See [0032]; [0038] and [0041]}, the pressure is about 1-20 Torr, the duration is about 30-120 seconds [0046]; the ratio of  $H_2/H_2+O_2$  is in the range about 0.1%-40%, therefore, the ratio  $H_2: O_2$  is about 0.01 (Let x be  $H_2$ , y be  $O_2$ ;  $x+y = 100\% = 1$  and  $x/(x+y) = 0.1$ ; we got  $x:y = 0.01$ ). It would have been obvious to one with ordinary skill in the art at the time of the invention to form an oxide film by using a dry ISSG process as taught by Wang in the process of You. As recognized by one skilled in the art, a

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dry ISSG process provides excellent thickness control and the thermal budget can be reduced (Abstract).

Note that the dry ISSG process is often described as a process generates short lived oxygen radicals {See Xing et al. (US 20030124873) ([0026]-[0038]) for evidence of the state of the art in which atomic oxygen is created by an ISSG process}. Furthermore, the ISSG process of You and Wang meet the structural and methodological limitations of this claim, thus they would (as an obvious consequence) also exhibit the same functional characteristics (i.e. generates short lived oxygen radicals whose reactivity extinguishes before the short lived oxygen radicals are able to permeate as deep into the ONO-type memory cell stack and oxidize materials therein as would the reactive oxygen of a High Temperature Oxidation (HTO) process applied to an essentially same ONO-type memory cell stack).

Regarding claim 9, You discloses exposed material layers of the ONO-type memory cell stack includes: a first silicon nitride layer 106a; a first silicon layer (floating gate 104); and a first silicon oxide layer 105a adjacent to the first silicon layer 104 (fig. 2C).

Regarding claim 12, You and Wang fails to disclose a height variation ratio is about 1.20 or less. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined process of You and Wang by selecting a suitable thickness/height ratio in order to achieve a specific sidewall dielectric, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges for result effective variables involves only routine skill in the art. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). Moreover, the specification contains no disclosure of either the critical nature of the claimed process/device (i.e. - thickness/height ratio)



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or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the Applicant must show that the chosen limitation are critical. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990).

Regarding claims 13 and 14, as recognized by one skilled in the art that a larger erase speed is obtained in a memory cell after formation of the sidewall dielectric by the dry ISSG process {See Fujimoto et al. (US Pat. 6,830,973); col. 7, lines 32-38 and Applicants specification, paragraph [0039]}. Note that the ISSG process of You and Wang meet the structural and methodological limitations of this claim, thus they would (as an obvious consequence) also exhibit the same functional characteristics.

### **Allowable Subject Matter**

3. Claims 25 and 28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### **Response to Arguments**

4. Applicant's arguments filed April 23, 2007 have been fully considered but they are not persuasive.

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5. In response to applicant's argument that the person of ordinary skill (PHOSITA) in 103 rejection is not available for interrogation at the present moment because PHOSITA exists only in the past. However, the examiner recognizes that obviousness as set forth in 35 USC 103 can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the motivation has been given as " a dry ISSG process provides excellent thickness control and the thermal budget can be reduced (Abstract)." It is submitted that proper motivation as required by law has been supplied. The examiner is relying on common knowledge to the ordinary artisan for the motivation to combine. If applicant has any question with respect the case law regarding common knowledge, he should direct them to the Federal Circuit, since they are the "authority". Further more, since applicant has not stated on the record that "a dry ISSG process provides excellent thickness control and the thermal budget can be reduced" is not common knowledge ordinary artisan in this prior art, Examiner sees no reason at this time to withdrawn the rejection due to an improper motivation statement. Therefore, applicant's arguments are not persuasive and the rejection is proper.

6. Applicant's argues that You '613 "would avoid using a thermal oxidation process that includes hydrogen."

First, it appears that Applicant is arguing that the oxide film 116 (fig. 2C) in You '613 must be made of dry oxidation process. However, You '613 merely states "for example a dry oxidation process... ". This does not necessarily mean the oxide film 116 must be made a dry



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oxidation process, since the oxide film 116 can be formed by various methods (i.e., using O<sub>2</sub> or a mixture of H<sub>2</sub>/O<sub>2</sub> as the oxygen source or other methods involving exposing the ONO-type memory cell stack to oxidant). You teaches that dry oxidation process is one the choice of forming the oxide layer 116 (i.e. "for example..." (col. 7, lines 39-40). The fact is that nowhere in the You reference does You teach that other oxidation process beside a dry oxidation process cannot or should not be used for forming the oxide layer 116. In addition, no element or process used in the description of the You '613 should be construed as critical or essential to the prior art unless explicitly described as such. Second, no where do the You '613 define the process in which the thermal oxidation process is try to avoid using hydrogen. Applicant appears to be merely stating opinion (i.e. "would avoid"). You does not state that hydrogen is prohibited from being used in conjunction with the ONO-type memory stack. Finally, applicant's argument however, read too much into the language "a dry oxidation process" in You '613. It should be noted that the 103(a) rejection is base on the structure of You (the ONO-type memory cell stack) and the process of Wang (ISSG). In all, the arguments are not persuasive.

### Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Vu whose telephone number is (571) 272-1798. The examiner can normally be reached on Monday-Friday from 8:00am to 5:00pm. If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Loke H can be reached on (571) 272-1657. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR, Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
DAVID VU  
PRIMARY EXAMINER